GERTSENSHTEYN, M.Ye.

POTEMKIN, V.V.; GERTSENSHTEYN, M.Ye.

G.V.Gordeev's strata theory. Zhur.eksp. i teor.fiz. 24 no.5:610-612 My '53.
(Nuclear physics) (MLRA 7:10)

GERTSENSHTEYN, M. Ye.

USSR/Physics - Self-excited oscillations FD 405

Card 1/1

Author : Gertsenshteyn, M. Ye.

Title : Self-excited oscillations in gaseous discharge at high pressures

Periodical : Zhur. eksp. i teor. fiz. 26, 57-63, Jan 1954

Abstract : Treats the interaction of sound waves and electron waves in gas-discharge plasma. Demonstrates the possibility of self-excited oscillations for a definite interval of frequencies. Thanks V. V. Potemkin for his judgment of the physical results. Fourteen references, including K. F. Teodorchik, Avtokolebatel'nyye sistemy (Self-excited oscillatory systems), State Technical-Theoretical Literature Press, 1952.

Institution : Moscow State University

Submitted : November ., 19 .

GERTSENSHTEYN, M. Ye.

USSR/Physics - Electrodynamics

FD-?15

Card 1/1 : Pub 146-3/1?

Author : Gertsensh..., ...

Title : Energy c... in spatial dispersing media

Periodical : Zhur. eksp. i teo.. fiz., 26, ...-..., Jun 195?

Abstract : S. M. Rytov's results (Ibid. 17, 930 (1947)) are generalized to the case of spatial dispersion when the partial derivative is not zero. It is shown that in this case the velocity of energy propagation coincides with the group velocity. ? references. Indebted to V. V. Potemkin.

Institution : --

Submitted : October 15, 1952

GERTSENSHTEYN, M. Ye

USSR/Physics - Plasma

Card 1/1 Pub. 146-8/21 FD-795

Author : Gertsenshteyn, M. Ye.

Title : Dielectric permeability of plasma located in a stationary magnetic field

Periodical : Zhur. eksp. i teor. fiz., 27, 180-188, Aug 1954

Abstract : The tensor of the complex dielectric permeability of an electron gas is computed taking into account the thermal motion of electrons. Indebted to V. V. Potemkin. Sixteen references, including 3 foreign

Institution : Central Scientific Research Institute of Radio Measurements

Submitted : October 15, 1953

GERTSENSHTEYN, M.YE.

√ **Low-frequency oscillations in the positive column of a glow discharge.** M. E. Gertsenshtein and V. V. Potemkin (Moscow State Univ.). *Zhur. Eksptl. i Teoret. Fiz.* **27**, 643-54(1954).—It is assumed that the phase delay is caused by longitudinal electromagnetic waves propagated along the axis of the pos. column. The internal resistance of a discharge tube as a wave generator is of the order of several hundred ohms. An analysis of luminescent phenomena in the discharge shows that there is a connection between the waves and the current pulses; the periodic luminous structure disappears on lowering the pressure at a pressure p_{min}. An equiv. circuit is developed for the discharge tube acting as a pulse generator. The amplitude and the frequency of pulsation are changing periodically with the anode-cathode distance. S. Pakswer

6 ?

1

GERTSENSHTEYN, M. Ye.

Influence of elastic collisions of electrons and molecules on longitudinal electric waves in plasma. M. E. Gertsenshtein (Moscow State Univ.). *Zhur. Eksptl. i Teoret. Fiz.* 27, 662-8(1954).—A simplified form is developed for the collision integral. Two cases are discussed: (1) that when the phase velocity of the longitudinal wave is large compared to thermal velocity and (2) that when the phase velocity is small. In the 2nd case the losses are so small that a small quantity of energy will cause oscillations by autoexcitation. 6 2

S. Pakswer

GERTSENSHTEYN, M.Ye.

Correlation of fluctuations in electron gases. Zhur. tekh. fiz. 25 no.5:834-840 My '55. (MLRA 8:7)
(Electrons)

GERTSENSHTEYN, M.Ye.; BRYANSKIY, L.N.

Attenuator errors due to disagreement in the path of superhigh frequencies. Izm.tekh. no.1:28-33 Ja-F '56. (MLRA 9:5)
(Radio, Shortwave) (Wave guides)

GERTSENSHTEYN, M.Ye.

Determining the shunting conductivity of the probe in recording circuits. Izm.tekh. no.4:37-38 Jl-Ag '56. (MLRA 9:11)
(Electric measurements)

GERTSENSHTEYN, M.Ye.; BRYANSKIY, L.N.

Eliminating phase distortions in power measurements. Izm.tekh. no.6:40-43 N-D '56. (MLRA 10:1)
(Electric measurements)

AUTHOR : Gertsenshteyn, M.E. and POKRAS, A.M.

"Wave Guide Splitter with Variable Coupling,"
A-U Sci Conf dedicated to "Radio Day," Moscow, 20-25 May 1957.

PERIODICAL: Radiotekhnika i Elektronika, Vol. 2, No. 9, pp. 1221-1224,
1957, (USSR)

APPROVED FOR RELEASE: 09/24/2001 CIA-RDP86-00513R000514920017-2"

[illegible], A. Ya. and VASILYEV, V. P.

[illegible]

AUTHOR: Gertsenshteyn, V.Ye. [illegible]

TITLE: Precision Electronic Voltmeter for Relative Measurements (Pretsizionnyy lampovyy vol'tmetr dlya otnositel'nykh izmereniy)

PERIODICAL: Izmeritel'naya tekhnika, 19[illegible], Nr [illegible], pp [illegible]

ABSTRACT: Measurements of audio frequency voltages are in most cases relative: a signal of constant frequency and form is fed to the voltmeter and the relations of the amplitudes are measured. The linearity of the amplitude characteristic is, however, insufficient. The rectifying process of the a-c voltage is accompanied by non-linear distortions. A new voltmeter has been developed, therefore, the circuit diagram of which is shown in Figure 1. The kenotron [illegible] is used as a rectifying tube. The amplitude value of the sinusoidal voltage on the diode is 90 v. The measuring circuit for checking the linearity is given in Figure 2. The results of the measurements de-

Card 1/2

[illegible]

Precision Electronic Voltmeter for Relative Measurements

monstrated that the error in the section of 75-100 divisions does not exceed [illegible] %.
There are [illegible] graphs, [illegible] diagrams and [illegible] references, [illegible] of which are Soviet and 1 German.

Card 2/2

APPROVED FOR RELEASE: 09/24/2001 CIA-RDP86-00513R000514920017-2"

10?-5-?-14/

AUTHOR: [illegible], N.Ye. and [illegible], L.N.

TITLE: [illegible] Phase-Shifter Having a Low Reflection Coef[illegible] ([illegible] volnovodnyy fazovrashchatel')

PERIODICAL: Radiotekhnika i Elektronika, 1958, Vol III, Nr 5, pp 710 - 721 (USSR)

ABSTRACT: The standing wave ratio of a terminating load in a wave-guide can be measured either by means of a movable probe, or by a fixed probe and a phase-shifter. The first method is not suitable for the measurement of small standing-wave ratios (SWR) since its accuracy is comparatively low. A higher accuracy can be achieved by employing the phase-shifter method; the equipment necessary for these measurements consists of (see Fig.2). 1) An ultra-high-frequency oscillator; 2) A matching transformer; 3) A fixed detector head; 4) A phase-shifter and, 5) the load. It is shown, however, that when measuring small reflections, the phase-shifter is subject to the following errors: inaccuracies due to the losses in the phase-shifter, reflections from the movable elements of the shifter, errors due to the mis-matching of the oscillator and the shifting action of the probe. The errors due to the reflections at the elements of the phase-shifter are analysed in detail. It is assumed that the phase-shifter consists of a

Card 1/[illegible]

Waveguide Phase-Shifter Having a Low Reflection Coefficient

dielectric plate whose thickness is s and height is h; the permittivity of the material of the plate is ε and the [illegible] [illegible] [illegible] [illegible] conditions expressed by:

$$\frac{s}{h} \ll 1; \quad \frac{2\pi s}{\lambda} \ll 1; \quad \lambda = \frac{\lambda_0}{\sqrt{\varepsilon}} \qquad (8)$$

where λ_0 is the wavelength in free space. If it is assumed that the material of the plate is anisotropic, the boundary conditions at the plate can be written as Eq.(10) where E' and D' are the field and the electric induction in the plate. The analysis of the conditions in the system can be carried out by solving Eq.(11), in which A defines a vector potential. Solution of Eq.(11) is in the form of a series expressed by:

$$A(x, y, z) = \sum a_m(z)\, A_m^0(x, y) \qquad (14)$$

where the amplitudes a_m can be obtained by solving an infinite system of differential equations, as expressed by Eqs.(15), in which ε_m is given by Eq.(16). Eq.(15) can be solved by the method of successive approximations and in the first approximation

they can be expressed in the form of Eqs.(19). Solution of Eqs.(19) is in the form of Eqs.(20) and (21) where $\varphi(x)$ ... the plate. On the basis of the above equations, it is ... that the phase shift produced by the shifter can be expressed by:

$$\vartheta = \frac{1}{ab} \frac{\varepsilon - 1}{\sqrt{1 - \omega_c^2/\omega^2}} \frac{\omega}{c} \sin^2 \frac{\pi x}{a} \int_{-\infty}^{+\infty} \ldots dz \qquad (27)$$

where a and b are the dimensions of the waveguide and x is the distance between the plate of the phase-shifter and the narrow wall of the guide. The reflection coefficient of the phase-shifter can be expressed by:

$$\ldots = \frac{1}{ab} \sin^2 \frac{\pi x}{a} \frac{\omega}{c} \frac{\varepsilon - 1}{\sqrt{1 - \omega_c^2/\omega^2}} \int_{-\infty}^{+\infty} \ldots(z) e^{-2i\ldots} dz \qquad (28)$$

which, for a symmetrical plate, is in the form of Eq.(29). Eqs.(27) and (28) can be regarded as the basic formulae for

Card 3/7

Waveguide Phase-shifter Having a Low Reflection Coefficient

the design of a phase-shifter. It is shown that the error of measurement of the reflection coefficient of the load $\delta\Gamma_H$ is related to the reflection coefficient of the phase-shifter, $\Gamma_{\bar{Q}}$, by means of Eq.(30). From this, it follows that the worst conditions (maximum error) are expressed by:

$$\delta\Gamma_H = \frac{\sqrt{2}}{2}\Gamma_{\bar{Q}} = 0.707\,\Gamma_{\bar{Q}} \qquad (31).$$

The reflection coefficient of the phase-shifter can be measured experimentally by means of the equipment shown in Fig.7; this consists of a [illegible] detector load, an auxiliary phase-shifter, the investigated phase-shifter, a matching transformer and a terminating load. Eq.(33) can be used to design a phase-shifter [illegible], [illegible], it is transformed into Eq.([illegible]), in which Γ is given by Eq.(37). In this equation, $(\Delta s)_0$ denotes the transverse dimensions of the phase-shifter [illegible] at its largest cross-section (in the centre). Eq.(38) shows that the [illegible] satisfactory shapes of the phase-shifting [illegible] that [illegible] by Eq.(40), where a is a parameter.

Card 4/5 For [illegible], [illegible] of the [illegible] [illegible]

109-3-5-14/17

Waveguide Phase-shifter Having a Low Reflection Coefficient

the form of Eq.(41). An experimental phase-shifter, ... in Eq.(41), was constructed and it was found that its reflection coefficient was so low that it could not be measured by means of a measuring line. It was found by employing the method of Fig.5 that the standing wave ratio was better than 1.00%. There are 6 figures and 12 references, 9 of which are Soviet and 3 English.

ASSOCIATION: Vsesoyuznyy n.-i institut fiziko-tekhnicheskikh i radiotekhnicheskikh izmereniy (All-Union Scientific Research Institute for Physico-engineering and Radio-engineering Measurements)

SUBMITTED: July 30, 1956

AVAILABLE: Library of Congress

Card 5/5

1. Wave ratio-Measurement 2. Phase shifter-Applications

AUTHOR: Gertsenshteyn, M. Ye. [illegible]

TITLE: Spatial Beats of Noise Waves in Coupled Delay Devices (Lines) (Prostranstvennyye biyeniya shumovykh voln v svyazannykh zamedlitelyakh)

PERIODICAL: Radiotekhnika i Elektronika, 19[illegible], Vol 3, Nr 10, pp 1234 - 12[illegible] (USSR)

ABSTRACT: The investigation of the complex problems of wave [illegible] in electron beams or in electron gas can be approximately treated as a problem of formal electrodynamics. [illegible] the fundamental equations contain a permittivity operator $\hat{\varepsilon}$ for the electron gas. The Maxwell equations are [illegible] fore written in the form of Eqs.(1) where j and ρ are the currents and charges which excite the [illegible]. The permittivity is a function of frequency [illegible] and of the wave number k, i.e:

$$\hat{\varepsilon} = \hat{\varepsilon}(\omega, k) \qquad (2)$$

where the sign on top denotes an operator. [illegible] the electrodynamic equations, [illegible] arise; firstly, the system (electron [illegible] and the electromagnetic field) have a large number of the degrees of

Card1/6

freedom; secondly, the meaning of j and ρ is not clear and the sources of noise are not taken into account. It is therefore necessary to consider the following kinetic equation for the distribution function f:

$$\frac{\partial f}{\partial t} + v \frac{\partial f}{\partial r} + \frac{e}{m}\left\{E + \left[\frac{v}{c} H\right]\right\}\frac{\partial f}{\partial v} = 0 \qquad (3).$$

The electromagnetic fields have to satisfy the equation system (4). The oscillatory component of the distribution function φ is expressed by Eq.(5), where $\hat{L}$ is a linear operator, as defined by Eq.(6). From the theory of linear, differential equations (Ref 9), it follows that the solution of Eq.(5) in a fixed region of space can be represented as Eq.(7), where φ_{sv} corresponds to free oscillations and is independent of the field, φ_{vyn} is analogous to the forced oscillations and proportional to the righthand side of Eq.(5).

Card2/6

Consequently, the second component ... Eq.( ) the boundary conditions given by Eq.( ), ... motion of electrons under the ... components of the electromagnetic field. ... Eqs.( ) can be written as Eq.( ), where ... is the Green function of Eq.( ). The ... components of the charges and currents can be expressed ... Eq.(11), so that the component j_{vyn} can be linearly expressed by the field $E_{\sim}$, as shown in Eq.(12). The operator $\hat{G}$ is given by Eq.(13). The shot noise in electron beams can be evaluated on the basis of the distribution function given by Eq.(15), in which r_i and v_i are the radius vector and velocity of the i-th electron. On the other hand, the component of the distribution function expressed by Eq.(3), which describes the noise, is ... Eq.(16). Consequently, the function φ_{sh} can be expressed by analogy with Eq.(7), as a sum of ... (Eq.( )). The current and the charge noise can be ... Eqs.(18), where j_i is the noise current ...

Card 3/6

electron. On the basis of the above analysis, [illegible] concluded that [illegible] arbitrary linear system [illegible] by the following [illegible] of the [illegible] electrodynamics:

$$\mathrm{rot}\, H = \frac{i\omega}{c}\hat{\varepsilon} E + \frac{4\pi}{c}(j_A + j_{sv} + j_{sh}) \; ;$$

$$\mathrm{rot}\, E = -\frac{i\omega}{c} H \; ;$$

$$\mathrm{div}\, \hat{\varepsilon} E = 4\pi(\rho_A + \rho_{sv} + \rho_{sb}) \; ; \qquad (1[illegible])$$

$$\mathrm{div}\, H = 0 \; ,$$

where j_A and ρ_A are the currents and charges in [illegible] antennae which excite the system. The [illegible] the normal waves (on the basis of Eqs.(1[illegible])) [illegible] where k_n is the propagation constant for the n-th [illegible]

Card 4/6

[illegible] of Noise Waves in Coupled Delay Devices (L[illegible]) [illegible]

in a delay system, and J_1 is [illegible] wave; J_2 is expressed by Eq.(31), where [illegible] is [illegible] cross-section [illegible] (a waveguide). In [illegible] delay device [illegible] contains only one wave, [illegible] by Eq.(24), where β_0 is [illegible] vector of the electron beam, e is the electron charge and γ is the [illegible] coefficient dependent on the structure of the field in the device. The solution of the equation [illegible] form of Eq.(30), where k_3 is the [illegible] as is expressed by the last equation [illegible]. From this, it is seen that an exchange of [illegible] between the two waves. By analogy [illegible] waveguides, these phenomena can be referred to as the spatial noise beats in slow-wave systems. The [illegible] were first discovered by [illegible] (Ref [illegible]) and today they find applications [illegible].

Card 5/6

[illegible]/[illegible]-[illegible]-[illegible]-[illegible]/[illegible]

Spatial Beats of Noise Waves in Coupled Delay Devices (Lines)

There are 17 references, 13 of which are Soviet, 1 English and 1 German; three of the Soviet [illegible] lated from English.

ASSOCIATION: Vsesoyuznyy n.-i in-t fiziko-tekhnicheskikh i radiotekhnicheskikh izmereniy (All-Union Scientific Research Institute of Physico-technical and Radio-engineering Measurements)

SUBMITTED: July 30, 1956

Card 6/6

1. Delay lines--Theory 2. Electromagnetic fields--Mathematical analysis

6(4), 7(7) SOV/108-13-12-3/12

AUTHORS: Gertsenshteyn, M. Ye., Pokras, A. M., Solovey, L. G.

TITLE: Multi-Channel System of Parallel Selection Waveguides with Variable Couplings (Mnogostvol'naya sistema parallel'noy selektsii s reguliruyemymi svyazyami)

PERIODICAL: Radiotekhnika, 1958, Vol 13, Nr 12, pp 20-25 (USSR)

ABSTRACT: With relatively narrow bands or not too high claims with respect to the adaptation, the problem of dividing or joining the channels can be solved by means of a system of shunted series-resonance circuits. The various filters are connected, in parallel to each other, to the common conductor by a simple or compact tap. A simple method of setting up a tap for the shunted series-resonance circuits is given. This method is based on the calculation data without intricate experimental work. At first, the paralleling of the resonance circuits is investigated. The obtained formulae (3) and (5) show that the tap must be tuned jointly with the filter connected to it, with one element. The input resistance of filters with several elements is then investigated and it is shown that the mutual influence of the various channels is determined essentially by the input resona-

Card 1/2

SOV/108-13-12-3/12

Multi-Channel System of Parallel Selection Waveguides with Variable Couplings

tors. Therefore, the input resonators of the filters with several elements must also be tuned with the taps. The connection of the filters to the common line is then investigated. The connection to the main waveguide is made variable by means of screws with a steplike cross section. By means of the method given in this article, a simple waveguide tap is worked out for a system with shunted series-resonance circuits with an input transient wave factor of ≈ 0.95 in the middle of the band. There are 7 figures, 1 table, and 3 Soviet references.

SUBMITTED: June 1, 1957

Card 2/2

GERTSENSHTEYN, M. YE.

56-1-55/56

AUTHORS: Bonch-Bruyevich, V. L., Gertsenshteyn, M. Ye.

TITLE: On the Theory of the Magnetic Susceptibility of Metals (K teorii magnitnoy vospriimchivosti metallov)

PERIODICAL: Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, 1958, Vol. 34, Nr 1, pp. 261 - 261 (USSR)

ABSTRACT: The magnetic susceptibility of the electron gas was recently (references 1, 2, 3) calculated with the taking into account of the distant Coulomb correlation. In this connection, however, only the susceptibility caused by the Fermi branch of the spectrum of excitations was taken into account. But the authors want to call attention to the fact that the Bose quanta of plasma vibrations also furnish a certain contribution to the susceptibility. It is true that these excitations are neutral and do not furnish any contribution to the current, but their energy depends on the field strength of the magnetic field H and therefore the plasma-quanta are"carriers of magnetism". At the usual temperatures the real plasma-quanta are practically not excited in metal, but their zero energy also depends on H. This leads, as shown here, to a plasma--diamagnetism comparable with the Landau diamagnetism. In a weak magnetic field a separation of the plasma vibrations in longitu-

Card 1/2

56-1-55/56

On the Theory of the Magnetic Susceptibility of Metals

dinal and transversal vibrations is also possible. For the case discussed here only the former are of interest. An expression for the frequency of the longitudinal plasma-quantum is given. Then the author gives an expression for the magnetic susceptibility caused by the dependence of the zero energy of the plasma on the magnetic field. The neglect of the zero energy of the plasma is generally not at all justified and the quantitative agreement of the theory by Pines (reference 1) with the experiment must anew be checked. There are 5 references, 2 of which are Slavic.

ASSOCIATION: Moscow State University (Moskovskiy gosudarstvennyy universitet)

SUBMITTED: November 21, 1957

AVAILABLE: Library of Congress

Card 2/2

…RTSEN…TEYN, M. YE.

[illegible]

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10 июня

(с 18 до 22 часов)

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11 июня

(с 10 до 16 часов)

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[illegible]

[illegible]

11 июня

(с 18 до 22 часов)

report submitted for the Centennial Meeting of the Scientific Technological Society of Radio Engineering and Electrical Communications im. A. S. Popov (VNORiE), Moscow, 8-12 June. 1959

AUTHOR: Gertsenshteyn, M.Ye.

TITLE Noise in an Electron Beam (O shumakh elektronnogo puchka)

PERIODICAL. Radiotekhnika i Elektronika, 1959, Vol 4, Nr 1, pp 146 - 147 (USSR)

ABSTRACT An electron beam contains two types of noise; one of these can be referred to as the cathode noise and is due to the emission processes at the cathode which produces the beam. The second type of noise can be referred to as the volume noise and is due to the processes occurring in the electron beam itself. In the vicinity of the cathode, the cathode noise is predominant while the volume noise is comparatively low. It can be expected that at large distances from the cathode, the volume noise will become significant, while the cathode noise is negligible. It is shown that the conditions for the predominance of the volume noise can be expressed by.

$$\ > 0.3 - 0.4 \quad (6)$$

$$\omega_0 t > 0.2 - 0.3 \quad (7)$$

Card 1/2

Noise in an Electron Beam SOV/109-4-1-27/30

where ζ is given by Eq (5), τ is the transit time for the drift space and ω_c is the Langmuir frequency. In Eq (5), u_o is the electron beam velocity, v_o is the thermal electron velocity and ω is the operating frequency.

There are 3 references, 2 of which are Soviet and 1 English.

SUBMITTED. February 21, 1958

Card 2/2

16(1),16(2) 05793

AUTHORS: Gertsenshteyn, M. Ye., and Vasil'yev, V. B. SOV/52-4-4-4/13

TITLE: Waveguide With the Random Inhomogeneities and Brownian Motion on the Lobachevskiy Plane

PERIODICAL: Teoriya veroyatnostey i yeye primeneniya, 1959, Vol 4, Nr 4, pp 424-432 (USSR)

ABSTRACT: The authors consider a waveguide with random inhomogeneities. Let r_i be the reflection coefficient (ratio of the amplitudes of the reflected and original wave) of a single inhomogeneity. Let all r_i be independent random functions with known statistical characteristics. The authors ask for the reflection coefficient of the whole waveguide. It is shown that the problem can be reduced to the Brownian motion in the Lobachevskiy plane. At first two inhomogeneities are considered and it is stated that the resulting reflection coefficient is a broken linear function mapping the unit circle onto itself. Therewith the relation with the Lobachevskiy plane is given. For several inhomogeneities the image point moves in the Lobachevskiy plane, while the sum of the corresponding noneuclidean distances yields the total effect of the inhomogeneities. If the considered random process is continuous, then it leads to the diffusion equation in the Lobachevskiy plane

SUBMITTED: December 25, 1958

Card 1/1

SOV/109-4-4-7/24

AUTHORS: Gertsenshteyn, M.Ye. and Vasil'yev, V.B.

TITLE: The Diffusion Equation of a Statistically Non-homogeneous Waveguide (Diffuzionnoye uravneniye dlya statisticheski neodnorodnogo volnovoda)

PERIODICAL: Radiotekhnika i elektronika, 1959, Vol 4, Nr 4, pp 611 - 617 (USSR)

ABSTRACT: It is assumed that the complex reflection coefficient of the system is $r = x + iy$ and that its probability density distribution satisfies the diffusion equation:

$$D\left(\frac{\partial^2 W}{\partial x^2} + \frac{\partial^2 W}{\partial y^2}\right) = \frac{\partial W}{\partial z} \qquad (3)$$

where D is the statistical characteristic of the waveguide; this is equal to the average half sum of the reflection coefficients squared per unit length of the waveguide; z is the distance along the length of the waveguide. If a normalised variable $t = \int D dz$ is introduced the equation can be written as Eq (4). When the waveguide

is terminated with a matched load, the solution of Eq (4) is in the form of Eq (5). It is seen that for large t, Eq (5) has no physical meaning. A different differential equation for the density probability function is, therefore, necessary. The equation should be such as to make the solution independent of the terminating load; also when $x^2 + y^2 \to 0$, the differential equation should coincide with Eq (4). These requirements are satisfied by

$$\Delta W = \frac{\partial W}{\partial t} \qquad (7)$$

where Δ is the Laplace operator on the Lobachevskiy surface. The operator is defined by Eq (8). By introducing a polar system of co-ordinates η, φ, as defined by Eqs (9), the Laplace operator is represented by Eq (10). If $\eta = i\theta$ and $u = \mathrm{ch}\,\eta$, Eq (10) can be expressed as Eq (11). This can be solved by introducing the Laplace transformations and leads to the Legendre equation which

SOV/109-4-4-7/24

The Diffusion Equation of a Statistically Non-homogeneous Waveguide

is in the form of Eq (13). In its final form, Eq (13) can be written as Eq (16). On the basis of the above, it is found that the average value for u is expressed by Eq (17). The average value of the reflection coefficient is approximately expressed by Eq (19). The value of the average reflection coefficient r as a function of t is plotted in Figure 2; Curve I corresponds to a linear approximation, while Curve II represents more accurate results. It is seen that Curve I gives values which are higher than those represented by Curve II. The physical meaning of this is that a part of the energy of the reflected wave travelling from the load towards the generator is reflected by the non-uniformities of the waveguide (towards the terminating load). The authors make acknowledgment to B.Ye. Kinber for discussing the work and for his valuable remarks.

Card 3/4

SOV/109-4-4-7/24

The Diffusion Equation of a Statistically Non-homogeneous Waveguide

There are 2 figures and 9 references, 1 of which is English and 8 Soviet. 1 of the Soviet references is translated from English.

SUBMITTED: November 26, 1957

Card 4/4

[illegible] SOV [illegible]

AUTHORS: B[illegible]chteyn, I. L. and G[illegible]shteyn, M. E.

TITLE: Possibility of Measuring the V[illegible] of [illegible] Distribution under Laboratory Conditions

PERIODICAL: Zhurnal eksperimental'noy i teoret[illegible] fiziki, [illegible], Vol [illegible], Nr [illegible], pp [illegible] (USSR)

ABSTRACT: A theoretical analysis was carried out for an experiment which would [illegible] the [illegible] of the propagation velocity [illegible] gravitational field can be [illegible] a rotating wheel equipped around [illegible] with heavy spheres. It was [illegible] gravitational field of sph[illegible] Newton delay potential. The [illegible] alternating gravitational field [illegible] in the plane of the wheel. The [illegible] sidered as mechanical [illegible] quency of alternating [illegible] between calculations of the [illegible] field during the rotation of the [illegible]

Card 1/3

Possibility of M[illegible] [illegible]
Gravitational Distribution [illegible]
Conditions

[illegible]

Card 1/[illegible]

Possibility of Measuring the Velocity of Gravitational Distribution under Laboratory Conditions

[illegible]
SOV/56-37-6-[illegible]

gravity. There is [illegible] Soviet reference.

SUBMITTED: July 29, 195[illegible]

Card 3/3

GERTSENSHTEYN, M. Ye.; BRYANSKIY, L.N.

Using phase shifters for eleiminating mismatch errors. Izm.tekh.
no.1:48-51 Ja '60. (MIRA 13:5)
(Phase converters)

AUTHORS: [illegible], M. E., [illegible]

TITLE: [illegible]

PERIODICAL: [illegible] (USSR)

ABSTRACT: [illegible]

APPROVED FOR RELEASE: 09/24/2001 CIA-RDP86-00513R000514920017-2"

ε ε μ μ

ε μ

$$\mathrm{rot}\,\mathbf{H} - \frac{1}{c}\dot{\mathbf{D}} = \frac{4\pi}{c}\mathbf{j},$$

$$\mathrm{rot}\,\mathbf{E} + \frac{1}{c}\dot{\mathbf{B}} = 0,$$

Concerning Electrodynamics of a Re[illegible] [illegible]
Containing A Gyrotropic Medium W[illegible] [illegible]
Variable Parameters

$$\mathbf{D} = \varepsilon(t)\,\mathbf{E}, \qquad ([illegible])$$

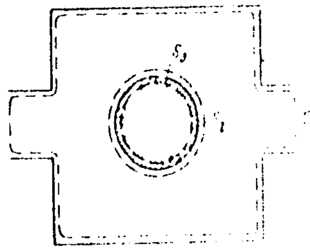
$$\mathbf{B} = \mu(t)\,\mathbf{H}. \qquad ([illegible])$$

E and **H** are weak al[illegible] strong pumping fiel[illegible] depending on time. From ([illegible]) [illegible] ([illegible]) [illegible] obtain:

$$-\frac{c}{4\pi}\operatorname{div}[\mathbf{E}\mathbf{H}] = \frac{1}{8\pi}\frac{d}{dt}\{(\varepsilon\mathbf{E},\ \mathbf{E}) + (\mu\mathbf{H},\ \mathbf{H})\} [illegible] (\mu\mathbf{H},\ \mathbf{H}) [illegible] \qquad ([illegible])$$

which is [illegible] [illegible] [illegible] formed into a [illegible].

[illegible]



S_2
S_1

Concerning Electrodynamics of a [illegible] Containing A Gyrotropic Medium With [illegible] Parameters

and substituting [illegible] ( ) [illegible]:

$$P_+ - P_- = \frac{d}{dt}\frac{1}{8\pi}\int (\varepsilon E, E) + (\mu H, H)\, d\tau \cdot \frac{1}{8\pi}\int (\dot{\varepsilon} E, E) + (\dot{\mu} H, H)\, d\tau \quad [illegible]$$

The above is [illegible] for [illegible] of time. While ( ) [illegible] E and H which are unknown [illegible] ( ) [illegible] considered as an approximate [illegible] structure. Relations similar [illegible] ( ) [illegible] obtained for [illegible] system with self-[illegible]. ( ) [illegible] litudes of normal waves [illegible] persionless medium. The [illegible] of a resonator partially [illegible] active substance where ε, ε( ) [illegible] μ, μ( ). [illegible] ε [illegible] μ [illegible] increment of the [illegible]:

$$\varepsilon = \varepsilon^0 + \varepsilon_1(t),$$
$$\mu = \mu^0 + \mu_1(t).$$

$$E = \sum_s a_s(t)\, E_s(r),$$
$$H = \sum_q b_q(t)\, H_q(r).$$

a_q, b_q E H

$$\operatorname{rot} E_q = \frac{1}{c}\omega_q \mu^0 H_q,$$
$$\operatorname{rot} H_s = \frac{1}{c}\omega_s \varepsilon^0 E_s.$$

Card 2/?

[illegible]

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Concerning Electrodynamics of a Res[illegible]
Containing A Girotropic Medium With [illegible]
Variable Parameters

In a similar way, [illegible]
can be transformed into two [illegible]
a_q and b_q only. ( ) [illegible]
normal waves in presence of [illegible] ε ε.
(ω ,t). μ μ(ω .) [illegible]
periodicity in time, [illegible]

$$\varepsilon_{ik}(\omega, t) = \sum_{-\infty}^{+\infty} \varepsilon_{ik}^{s}(\omega) e^{is\Omega_{s} t},$$

$$\mu_{ik}(\omega,t) = \sum \mu_{ik}^{s}(\omega) e^{is\Omega t}.$$

[illegible] ε . μ [illegible]
[illegible] ε [illegible]
[illegible] ε(ω . [illegible]
[illegible] Ω [illegible]

[illegible]

ω

E-D B H

E H

$$E = \sum_n E_n e^{i\omega_n t},$$
$$H = \sum_n H_n e^{i\omega_n t}.$$

$$\overline{\operatorname{div}[EH^*]} = -\frac{1}{\cdot}\sum_n\sum_m \omega_{\cdot}\,\{E \ldots\}$$

[illegible] A [illegible]

[illegible]

$$i\sum_{q} b_q \omega_q Q_{nq}^{(n)}(\omega) \ldots \sum_{q} \ldots Q_{q}(\omega) \ldots \sum \ldots A_{p}$$

$$i\sum_{q} a_q \omega_q Q_{nq}^{(m)}(\omega) \ldots \sum_{q} \ldots Q_{q}(\omega) \ldots \sum \ldots F_{i}$$

Here, φ_{ki} and ψ_{ki} [illegible]

from the [illegible]

frequency ω of the [illegible]

[illegible] δ_{ki} [illegible]

[illegible]

Ψ :

$$\mathbf{H} = -\operatorname{grad}\Psi$$

$$-\operatorname{div}\mu \operatorname{grad}\Psi$$

$$\frac{\partial^2\Psi}{\partial z^2} + (1+k)\left(\frac{\partial^2\Psi}{\partial x^2} + \frac{\partial^2\Psi}{\partial y^2}\right)$$

$$S = \frac{c}{4\pi}[EH^*] - \frac{\omega}{8\pi}\frac{\partial\mu}{\partial k}HH^*,$$

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[illegible]

9.4600,9.2180

77772
SOV/109-5-2-5/26

AUTHOR: Gertsenshteyn, M. E.

TITLE: Phase and Frequency Distortions in Mixers

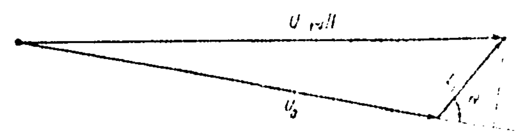
PERIODICAL: Radiotekhnika i elektronika, 1960, Vol 5, Nr 2, pp 214-217 (USSR)

ABSTRACT: Amplitude and phase distortions in crystal mixers at super high frequencies are analyzed assuming that the mixer is a six-pole network which can be described by a corresponding matrix of conductivity. This leads, however, to cumbersome calculations and not comprehensive end results. Provided the non-uniformity of the frequency characteristic is relatively mild, approximation methods can be used. The proposed method takes the wave picture as a starting point rather than currents and voltages. Distortions can be described by the interference of several waves arriving by different ways into the

Card 1/9

output field of the system. In the ideal s-h-f system only one path exists, but in the real system there may be parasitic paths caused by (a) detuning in the wave guide, (b) double conversion at mirror-frequency or due to harmonics, (c) "squeezing" of the signal from the oscillator to the receiver due to poor shielding. In all these cases an analysis of the frequency characteristic amounts to a vector analysis of the diagram. The full field at the output of the system is a vector sum (see Fig. 1.)

$$\vec{U}_{full} = \vec{U}_0 + \vec{U}_1 = U_0\left(1 + \frac{U_1}{U_0}\right) \quad (1).$$



Card 2/9

Fig. 1.

Phase and Frequency Distortion in [illegible]

[illegible]

γ [illegible]

$$\left.\begin{aligned} \Delta A\,(dB) &= 8{,}69\,\gamma\cos\theta \\ \Delta\varphi &= \gamma\sin\theta \end{aligned}\right\} \qquad (6)$$

[illegible]

$$(7)$$

Card [illegible]

[illegible] For small [illegible] small and [illegible] (7) [illegible]

Card

[illegible]

Phase Frequency Distortions in M[illegible]

[illegible]

large. In circuits of [illegible] frequencies only the term in ( ), [illegible] θ_{II} [illegible] shown below

$$\theta_{II} \quad [illegible] \qquad (1?)$$

[illegible] greater band

$$\frac{d^2\theta_{II}}{d\omega^2} = 0, \quad \frac{d\theta_{II}}{d\omega} = 2Q \frac{1}{m\omega} \qquad (1?)$$

leads to an expression [illegible] delay time

$$\theta_{II} \quad [illegible] \qquad (1?)$$

Card [illegible]

Phase Frequency Distortions in Mixers [illegible]

Thus distortions due to phase shifts in intermediate frequency circuits can be [illegible] greater than when due to incident phase at [illegible] frequencies. To avoid distortions at [illegible] frequencies, [illegible] frequency repeater must be [illegible] with [illegible], with a minimum of parasitic [illegible] (the use of cable is not permissible). [illegible] mixers placed after a traveling wave tube, [illegible] is of no importance, the use of [illegible] the energy is recommended. In the conclusion, the author reiterates the recommendation of [illegible] rectifiers between the mixer and the preselector and of active resistors in chains of powerful mixers. There are 4 Soviet references.

SUBMITTED: February 1[illegible], 1[illegible]

Card [illegible]

9.3240

7795[illegible]
SOV/1[illegible]-3-3-[illegible]

AUTHOR S: Gertsenshteyn, M. E., Kl[illegible], P. E.

TITLE: Phase Selectivity of Single-Circuit Parametric Amplifier

PERIODICAL: Radiotekhnika i elektronika, [illegible], Vol [illegible], Nr [illegible], pp [illegible]-[illegible] (USSR)

ABSTRACT: In contrast to conventional oscillators, the phase of oscillations generated by a self-excitation in parametric systems is determined by the phase of parametric modulation. Therefore, one can expect that a parametric amplifier will react on the phase of signal being amplified. Let it be called phase selectivity. The article deals with phase selectivity of a parametric amplifier with one degree of freedom (with reference to amplified signal). The phase selectivity causes a certain signal distortion, which disappears if several degrees of freedom are possible. [illegible]

Card [illegible]

[illegible] -Circuit [illegible]
[illegible] Amplifier

[illegible]

[illegible] ability has been studied [illegible] (by L. I. Mandel'shtam and N. D. Papaleksi [illegible] and M. D[illegible]), [illegible] paper of [illegible] and [illegible] [illegible] amplification [illegible] degree of freedom [illegible]:

$$\ddot{y} + 2\delta\dot{y} + \omega_0^2(1 + q\sin\nu t)\, y = \omega_0^2 \xi \cos\Omega t, \qquad (1)$$

where $y(t)$ [illegible] δ [illegible] parameter [illegible] ([illegible]): [illegible] frequency [illegible]: ν. [illegible] variable component of [illegible] ([illegible] frequency): ω [illegible]

Card [illegible]/17

$(\varphi - 1)$

$\pi/(\nu - \Omega)$

$\psi(\tau)$

(τ)

Card 4/11

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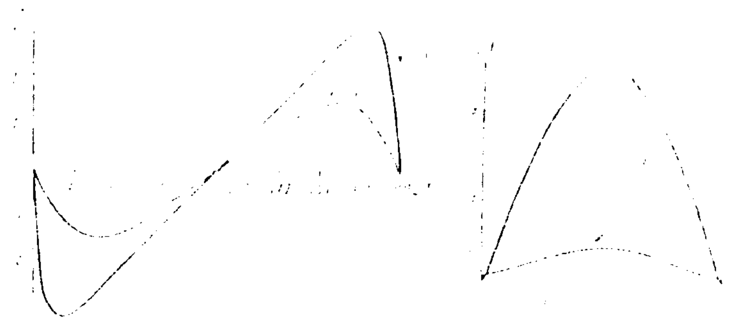

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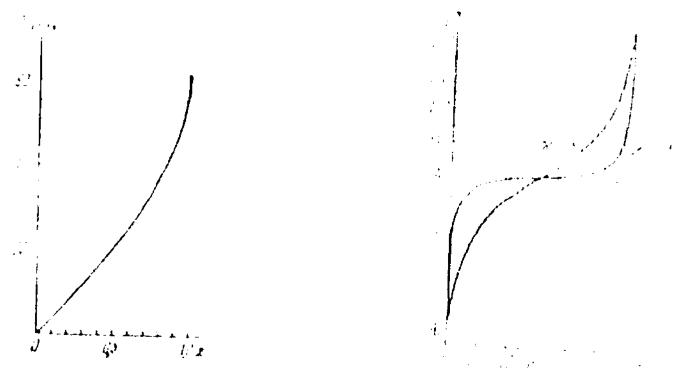

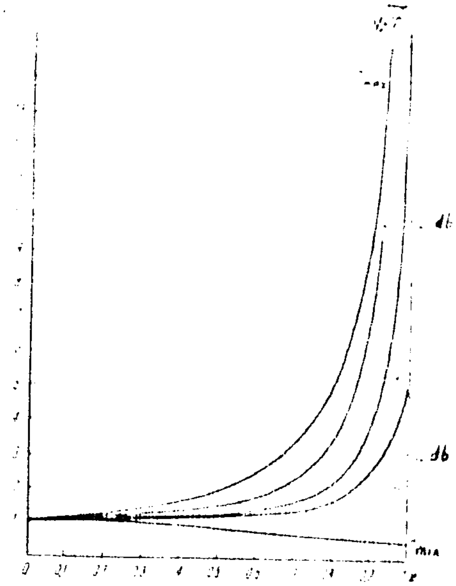

Fig. 5

Card 9/17

and the term with negative frequency, $e^{-i\omega t}$, is excluded. Assuming that only [illegible] frequencies are essential: positive $\Omega \simeq \omega_c$ and negative $\Omega - \nu = -\mu$, for $\nu \sim \omega_c$; $|\mu| \sim \omega$ [illegible] tions are sought as combinations of [illegible] frequencies Ω and $\Omega - \nu$:

[illegible]

where

[illegible]

a and b are the constants [illegible]. [illegible] quencies is shown in Fig. [illegible]. [illegible] μ and Ω are located symmetrically [illegible] one-half the pumping frequency (Fig. [illegible]). [illegible] sought in [illegible]:

Card [illegible]

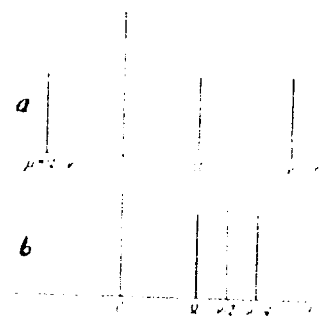

Fig. 6

Card 11/17

[illegible]

For a transition from [illegible] ... [illegible]:

[illegible]

[illegible]:

$$|k| = [illegible]$$

$$\arg k = \operatorname{arctg} [illegible]$$

Card [illegible]

[illegible]

[illegible] (4) [illegible] ... [illegible] method of [illegible] ... [illegible] the latter method can also [illegible] when the first one is no longer [illegible]. This applies to the amplifier with two degrees of freedom, where it is possible to eliminate beats by separating frequencies μ and Ω in the spectral [illegible]. In the circuit are oscillations of two frequencies — [illegible] Ω and [illegible] $\Omega - \nu = -\mu$, which are mirror images with reference to $\nu/2$, and beats of these frequencies are observed in load resistance. (5) Amplification of Modulated Signals by a Parametric Amplifier. Above, the amplification of a harmonic signal was analyzed. For analysis of a differently shaped signal, the spectral expansion is used. Complex transmission coefficient is:

Card 13/17

$$k = k_1(\omega) + k_2(\omega) e^{i\varphi}, \tag{23}$$

Phase Selectivity of Single-Circuit Parametric Amplifier

where coefficients k_1 and k_2 are:

$$k_1 = \frac{\omega_0^2}{2D(\omega)}[\omega_0^2 \quad \mu^2 \quad 2\Omega] \qquad (2)$$

$$k_2 = \frac{\omega_0^2 \Omega}{D(\omega)} \qquad (3)$$

Analyzing the amplification of ... Ω ... $f(t)$ ... multiplying its spectrum by the ... by a reversed Fourier transformation ...:

[illegible]

$$f_2(t) = \int e^{i\omega t}\psi(\omega)\,d\omega$$

Thus, in the case of a signal of any shape, phase selectivity is also present. (6) Noise Amplification. White spectrum noise is the totality of incoherent sinusoids with arbitrary phases; their amplification coefficient is (21). With a quadratic indicator, it is:

$$|K^2| = \frac{1+x^2}{(1-x^2)^2}. \qquad (29)$$

Consequently, phase selectivity does not play any role in noise amplification. Equation (29) is also valid if not only the phase of the amplified signal, but also the phase of the pumping field is arbitrary (or at

Phase Selectivity of Single-Circuit Parametric Amplifier

SOV/109-5-3-10/26

random). It seems that the field of an incoherent source can be used as the pumping field. Noises and distortions of such an amplifier, of course, should be investigated separately. (7) Influence of Phase Selectivity. From the above, it follows that phase selectivity leads to amplitude and phase modulation of the signal being amplified. Pulses at the output of a parametric amplifier are amplitude-modulated. This modulation can be removed with the help of a system of automatic amplitude regulation in the receiver. Analyzing FM of the signal, the spectral method is recommended. Conclusions: (1) A parametric amplifier with one degree of freedom, when amplifying a signal with frequency Ω, causes a beat modulation of the amplified signal, resulting in phase oscillations $\nu - 2\Omega$. (2) Solutions for near-resonance area by simplified equations and complex amplitude methods are identical, and the method of complex amplitudes can be used for the solution of more complicated problems. (3) A parametric amplifier with one degree of freedom is phase-selective, as its instant

Card 16/17

Phase Se[illegible] [illegible]
Parametric Ampli[illegible]

ampli[illegible] [illegible] signal. [illegible] b [illegible] phase [illegible] signal is [illegible] in amplitude and phase with a cycle of 2π [illegible] ν - 2Ω [illegible]. There are [illegible] figures and [illegible] references, [illegible] Soviet, [illegible]. The [illegible] references are: H. Heffner, [illegible] Wade, [illegible], [illegible] Wi[illegible], [illegible] Noise Characteristics [illegible] Parametric Amplifier, [illegible] Appl. Phys., [illegible], K. [illegible] Theory [illegible] Parametric Amplifi[illegible] [illegible] Reactance, [illegible] Re[illegible]. [illegible] F. Wade, Phase [illegible] Microwave Amplifier, Proc. IRE, [illegible]

SUBMITTED: May [illegible]

Card [illegible]

GERTSENSHTEYN, M. Ye.; VASIL'YEV, V.B.

In regards to S. I. Al'ber and V. I. Bespalov's letter "Diffusion equation for a statistically nonhomogenous wave guide. Radiotekh. i elektron. 6 no.3:449-450 Mr '61. (MIRA 14:3)
(Wave guides)
(Al'ber, S. I.) (Bespalov, V. I.)

89206

S/056/61/040/001/012/037
B102/B204

24.4400

AUTHOR: Gertsenshteyn, M. Ye.

TITLE: The laws of conservation in the general relativity

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, v. 40, no. 1, 1961, 114-122

TEXT: The author deals with two points in the theory of the laws of conservation which are, seen from the mathematical viewpoint not clear: 1) The energy momentum vector $P_i = \int t_i^k \, dS_k$ is in this integral representation not satisfactory, because the vector addition is not defined. 2) In the representation of the coordinate transformation (2):
$\delta x^i = \xi^i(x) = x_j^i(x)\delta\omega^j$, where $\delta\omega^j$ are the parameters of an element of the irreducible group of coordinate transformation (translation or rotation), it is not definitely said what functions $\xi^i(x)$ correspond to the translation. Integrals like the one abovementioned occur in the general relativity when the laws of conservation are being studied. If t_i^k is an energy momen-

Card 1/5

89206

The laws of conservation ... S/056/61/040/001/012/037
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tum pseudotensor, and if composition (integration) is carried out according to components (the coordinates are Euclidean at infinity), then the integral is independent of coordinate system; if, at $x^{\alpha} \to \infty$, ξ^{i} tend $\to$ const, the integral quantities, which were obtained in the integration of various energy-momentum tensors (which are produced by (2)), coincide. Such a situation, where the mathematical operation employed is not defined, and obtains sense only by the nature of the expression under the integral, is considered to be unsatisfactory by the author. Definition of the integral and the translation is purely geometric, and ought to be independent of the physical content of the problem. For determination of this integral in Riemann geometry, a so-called "free" vector field is introduced, which uniquely (i.e., independent of path) describing the shift of the origin of the coordinates is introduced: $P_i(x) = \hat{C}P_i(x_0)$, where $\hat{C}$ is the operator of the "harmonic" shift. $\xi^{i}(x)$ is considered to be a vector field, which obeys the following conditions: $\xi^{i}(x,x_0)$ is a unique function, $\xi^{i}(x)$ are vectors which are parallel in Euclidean space. Thus it is possible, like above, to put $\xi^{i}(x) = \hat{C}\xi^{i}(x_0)$. The harmonic shift is defined in all spaces

Card 2/5

that are topologically equivalent to Euclidean space; however, it differs from a parallel shift. For the "free" vector in a curvilinear pseudoeuclidean space $\nabla_k P^s(x) = 0$ holds, ∇_k denotes a covariant derivative, if k and s are independent, this equation contains 16 conditions. With the definition of the invariant $\zeta = \nabla_k P^k \equiv \mathrm{div}P$, and separation of the symmetric and antimetric part, $\xi_{ik} = \nabla_k P_i + \nabla_i P_k$, $\eta_{ik} = \nabla_k P_i - \nabla_i P_k$, it is possible to impose onto the vector field $P_i(x)$ the condition $\xi_{ik} = 0$ (which in itself comprises 10 conditions). These conditions have already been studied by V. A. Fok. They are satisfied only in a space of constant curvature ($\nabla_s R = 0$). The conditions (13): $\zeta = 0$, $\eta_{ik} = 0$ (7 conditions) are, on the other hand, satisfied in the case of arbitrary R^m_{iks}. The solution of (13) is given with $P_k = \nabla_k \varphi = \partial\varphi/\partial x^k$; $\Box\varphi = 0$. The general-covariant linear differential equations (13) define the geometric operation of a "harmonic" translation

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The laws of conservation ...

of the vector in a unique manner. There now exists, also in the general case of a space of arbitrary curvature, a preferred system of coordinates, in which the components of the vector remain unchanged in the case of a shift. The condition $\partial(\sqrt{-g}\, g^{ik})/\partial x^{i} = 0$; $g^{im}\Gamma^{k}_{im} = 0$ determines the class of the "harmonic" (preferred) system of coordinates. In such a system, the covariant vector components in harmonic translation do not change, and it is therefore possible to integrate the vectors by the components. Energy-momentum vector, - pseudotensor, energy density, and the Hamiltonian of the system should, therefore, be calculated in such a harmonic system. The case of infinitely small coordinate transformations is studied and the formula hereby for the energy-momentum tensor is applied to the gravitational field. For the canonic energy-momentum tensor, a unique expression is obtained which after symmetrization goes over into the Landau-Lifshits tensor. In conclusion, the case is studied in which the gravitational field may be considered to be a slight perturbation, and the results of calculations are compared in the various systems of coordinates. The

Card 4/5

89206

The laws of conservation ... S/056/61/040/001/012/037
B102/B204

author finally thanks V. L. Bonch-Bruyevich, Professor A. Z. Petrov, A. A. Fedorov, and L. G. Solovey for discussions. There are 10 references: 4 Soviet-bloc and 4 non-Soviet-bloc.

SUBMITTED: October 8, 1959 (initially) and March 9, 1960 (after revision)

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Card 5/5

26412
S/056/61/041/001/007/021
B102/B214

9.9867

AUTHOR: Gertsenshteyn, M. Ye.

TITLE: Wave resonance of light and gravitational waves

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, v. 41, no. 1(7), 1961, 113-114

TEXT: This paper gives an estimate of the energy of gravitational waves produced during the propagation of light in a constant electric or magnetic field. According to general relativity light and gravitational waves propagate with equal velocity, and the corresponding rays coincide with the zero geodesics. That means that, if there exists a linear relationship between light and gravitation waves, wave resonance known in radio physics must appear so that even in weak coupling a significant energy transfer may take place. In the presence of an electromagnetic field a weak gravitational field is described by

$$\Box\psi^{ik} = -16\pi\gamma c^{-4}\tau^{ik}, \quad \tau_k^k = 0, \quad \tau_{,k}^{ik} = 0, \qquad (1)$$

$$\tau_k^i = \frac{1}{4\pi}\left[F^{il}F_{kl} - \frac{1}{4}\delta_k^i\left(F^{lm}F_{ml}\right)\right], \quad \psi_i^k = h_i^k - \frac{1}{2}h\delta_i^k.$$

Card 1/5

where τ^{ik} is the energy - momentum tensor of the electromagnetic field, F^{ik} is the electromagnetic field tensor, γ the gravitational constant, and h_{ik} the perturbation of the metric tensor. Eq. (1) is used for investigating the propagation of light (F^{ik} field) in the presence of a strong magnetizing field $F^{(0)ik}$ constant in space and time. The energy - momentum tensor becomes the sum of three terms: square of a constant term, square of the light wave field, and an interference term describing the wave resonance. On neglecting the non-resonance term one obtains the relation

$$\Box\psi_k^i = -\frac{8\gamma}{c^4}\left[F^{(0)il}F_{kl} - \frac{1}{4}\delta_k^i\left(F^{(0)lm}F_{lm}\right)\right]. \qquad (2).$$

If the x-axis is taken in the direction of the wave vector and the wave amplitude is expressed in the units of energy density, one obtains

$$F_{kl} = b(x)\, f_{kl}\, e^{ikx}, \qquad f^{ol} f_{ol} = 1, \qquad k = \omega/c, \qquad (3)$$

$$\psi^{ik} = a(x)\sqrt{16\pi\gamma/c^4k^2}\,\zeta^{ik}e^{ikx}, \qquad \zeta_{ik}\zeta^{ik} = 1, \qquad \zeta_i^i = 0;$$

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B102/B214

Wave resonance of light and ...

where the amplitudes f_{kl} and ξ^{ik} are dimensionless. With this one obtains in the approximation of slowly varying amplitudes: $i da(x)/dx = \sqrt{\gamma/\pi c^4}\; F^{(0)il} f_{kl} \xi^k_i b(x)$. The solution of this equation has the form $a(x) = i\sqrt{\gamma/\pi c^4}\; f_{kl}\xi^k_i \int_0^x F^{(0)il}(s).b(s)ds + a(0)$, where the integration is made along the ray. If $a(0) = 0$ the external field is constant and the absorption or scattering of the light along the ray is small in the domain considered; i.e. $b(s) =$ constant so that $|a(x)/b(0)|^2 = (\gamma/\pi c^2)F^{(0)2}T^2$, where T is the time in which the ray traverses the constant field. The amplitude packet was here set equal to one. If the $F^{(0)}$ field is turbulent and random, it can be assumed for the purpose of estimating the energy of the gravitational wave that $F^{(0)}$ is constant along a path of length R_0 (R_0 - correlation radius of the $F^{(0)}$ field) and then changes by jumps and at random. The light amplitude $b(x)$ is practically constant along the ray; the amplitude of the gravitational wave is given by

Card 3/5

26412
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B102/B214

$$a(x) = \sum a_n; \qquad a_n = i\sqrt{\gamma/\pi c^4}\, f_{kl}\, \zeta_l^k \int\limits_{x_{n-1}}^{x_n} F^{(0)kl}(s)\, b(s)\, ds.$$

The gravitational waves excited at each portion of the path become incoherent. One obtains: $|a(x)/b|^2 = (\gamma/\pi c^3) F^{(0)2} R_0 T$. (7). For interstellar fields one obtains, for example, $|a/b|^2 \sim 10^{-17}$, ($T^{(0)} = 10^{-5}$ G, R_0 = 10 light years, T = 10^7 years). The frequency of the excited gravitational wave is determined by the light frequency. Strong magnetic fields exist also inside the stars, and therefore gravitational waves can be produced. Here the correlation radius a(x) is essentially determined by the free path of the radiation. For the calculation of the intensity of this wave (7) can also be used, but then T is the diffusion time of the energy of the ray in the star transparent to the radiation. It can be shown that (7) represents the ratio of the gravitational and light radiations of the star. Naturally, the intensity of the gravitational radiation is small and is unimportant for the energy balance of the star. There are 3 Soviet-bloc references.

34044
S/109/62/007/001/025/027
D266/D301

9.3240 (1040, 1139, 1154)

AUTHOR: Rabinovich-Vizel', A.A., and Gertsenshteyn, M.Ye.

TITLE: On the bandwidth of frequency multipliers employing non-linear capacitance

PERIODICAL: Radiotekhnika i elektronika, v. 7, no. 1, 1962, 175 - 177

TEXT: The purpose of the paper is to determine the bandwidth of frequency multipliers using non-linear elements. The authors first survey available literature and conclude that the efficiency of this type of frequency multiplier has received much attention, but hardly anything has been written on the attainable bandwidth. Next they quote K.M. Johnson's formulas, slightly rearrange them and find for the product of relative bandwidth and optimum efficiency

$$\eta_{opt} \frac{\Delta f}{f} = \sqrt{b_n^2 + (\omega_1 \tau)^2} \cdot \omega_1 \tau, \qquad (6)$$

where b_n depends on the nonlinear characteristics of the diode em-

Card 1/2

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On the bandwidth of frequency ...

ployed. ω_1 - fundamental frequency, τ - time constant of the diode, n - factor of multiplication. For a lossless diode

$$\tau = 0, \eta = 1, \frac{\Delta f}{f} = b_n, (Q_{D_1} b_n)^2 \gg 1 \quad (7)$$

where Q_{D_1} - quality of the diode at the frequency ω_1. In this case the bandwidth is dependent on n. If the losses are large $Q_{D_1} b_n \ll 1$, the bandwidth is mainly determined by the losses and independent of the harmonic number. If non-linear resistances are used there is no difficulty with bandwidth because broadband matching is possible. There are 5 references: 1 Soviet-bloc and 4 non-Soviet-bloc. The 4 most recent references to the English-language publications read as follows: C.H. Page, J. Res. Nat. Bur. Standards, 1956, 56, 4, 179; G. Luettgenau, M.V. Duffin, and P.H. Dirnbach, IRE Wescon Convention Record, 1960, part 3, 13; P.M. Fitzgerald, T.H. Lee, M.S. Moy, E.J. Powers and J.J. Younger, IRE Weson Convention Record, 1960, part 2, 43; K.M. Johnson, IRE Trans., 1960, MTT-8, 5, 525.

SUBMITTED: July 20, 1961

Card 2/2

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D234/D302

AUTHORS: Gertsenshteyn, M.Ye., and Kinber, B.Ye

TITLE: Stability of the super-regenerative regime of an amplifier with complex networks

PERIODICAL: Radiotekhnika i elektronika, v. 7, no. 3, 1962, 397 - 403

TEXT: The authors formulate equations for a parametric amplifier with variable capacity without frequency transformation, considering it as an n-terminal network. For the case of a two-circuit non-degenerate regenerative amplifier, an equation of Hill's type is deduced from the general equations; the stability of the solutions is determined by that of the solutions of the corresponding homogeneous equation. It is found that if a complicated input filter is used, whose band is not much wider than that of the amplifier, the domains of stability depend essentially on the parameters of superization. The case of an input filter consisting of two equal links is considered as an example; the homogeneous equation is reduced

Card 1/2